APPENDIX B

PROPOSED COUNT 1

Count 1. A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:

(a) a reservoir adapted to contain a fluid and enabling conduction of acoustic energy in a substantially uniform manner; and

(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a lens capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir, said ejector having an f-value of greater than 2.

APPENDIX C

SUPPORT FOR CLAIMS 1-142 IN THE PRESENT APPLICATION

The present application is a continuation of U.S. Patent Application Serial No. 09/735,709, filed December 12, 2000. For the Examiner's convenience, the citations in the table below refer to the paragraph numbering in U.S. Patent Publication No. 2002/0094582, which corresponds to the '709 application.

Claim #	Claim Limitation	Support in Applicants' Disclosure
1.	A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:...	[0008] "In order to overcome the deficiencies of the prior art, the present invention provides non-contact methods for the transfer of small amounts of fluid. Methods according to the present invention employ the use of acoustic waves to generate micro-droplets of fluid. In the methods, acoustic waves are propagated through a pool of a source fluid to cause the ejection of at least one, e.g., a single micro-droplet, from the surface of the pool. The droplet is ejected towards a target with sufficient force to provide for contact of the droplet with the target."
	...(a) a reservoir adapted to contain a fluid and enabling conduction of acoustic energy in a substantially uniform manner; and...	[0028] "As used herein, 'source fluid containment structure' is any structure suitable for containing or supporting a pool of source fluid and which allows an acoustic wave to propagate from a first side or end of the structure, through the structure to the second side or end of the structure, wherein the source fluid is contained on the second side or within the structure. Thus, suitable source fluid containment structures include a flat structure such as a slide (e.g., a glass or polystyrene microscope slide), or the like, onto which one or more discrete pools of source fluid may be deposited; also included are single and multi-well plates commonly used in molecular biology applications; capillaries (e.g., capillary arrays); and the like." [0030] "Source fluid containment structures may be constructed of any suitable material, bearing in mind the need for good acoustic velocity properties. Such materials include glass, polymer (e.g., polystyrene), metal, a textured material, a containment field, and the like, as well as combinations thereof. The material may further be porous or non-porous, or combinations thereof." [0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more.

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		One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)."
	...(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and ...	[0035] "As used herein, 'acoustic deposition emitter' means any device capable of generating a directional acoustic wave capable of causing ejection of at least one droplet of fluid from the surface of a pool of fluid. As understood by those of skill in the art, an acoustic wave or beam exerts a radiation pressure against objects upon which it impinges. Thus, when an acoustic wave or beam impinges on a free surface (e.g., fluid/air interface) of a pool of fluid from beneath, the radiation pressure which it exerts against the surface of the pool may reach a sufficiently high level to release at least one individual droplet of fluid from the pool, despite the restraining force of surface tension. In a preferred embodiment, a piezoelectric transducer is employed as an acoustic deposition emitter. In one embodiment, a piezoelectric transducer comprises a flat thin piezoelectric element, which is constructed between a pair of thin film electrode plates. As is understood by those of skill in the art, when a high frequency and appropriate magnitude voltage is applied across the thin film electrode plates of a piezoelectric transducer, RF energy will cause the piezoelectric element to be excited into a thickness mode oscillation. The resultant oscillation of the piezoelectric element generates a slightly diverging acoustic beam of acoustic waves. By directing the wave or beam onto an appropriate lens having a defined radius of curvature (e.g., a spherical lens, or the like), the acoustic beam can be brought to focus at a desired point."
	...a lens capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir,...	[0021] "In accordance with the present invention, there is provided an apparatus useful for non-contact fluid transfer. With reference to FIG. 1 there is schematically presented one embodiment of an apparatus of the present invention. The figure depicts a non-contact fluid transfer apparatus 5 having at least one acoustic liquid deposition emitter 60 in electrical communication with a computer 95. During operation the acoustic liquid deposition emitter 60 generates an acoustic wave or beam 10 that can be propagated through an optional wave channel 70. The acoustic wave can be focused by lens 75 prior to propagating through coupling fluid 20 to optimize the energy of the acoustic wave or beam 10 upon the liquid/air interface of source fluid 40. The acoustic wave 10 is propagated through a coupling medium 20 after which the wave is transmitted through source fluid containment structure 30 where the wave comes to focus at or near the surface of a pool of source fluid 40 thereby causing ejection of at least one droplet 50 of source fluid from the surface of the pool." [0045] "Proper focus of the acoustic wave can be achieved by providing a lens between the piezoelectric transducer and the coupling medium. Lenses contemplated for use in the practice of the present invention may be of constant curvature or aspherical. An aspherical lens (i.e., a lens having a compound curvature) may be employed to accommodate any irregularities in the acoustic wave, whether due to the piezoelectric element itself, a misalignment of the piezoelectric element with the surface of the pool of source fluid, or

Claim #	Claim Limitation	Support in Applicants' Disclosure
		the like."
	...said ejector having an f-value of greater than 2.	[0046] "To capture the maximum amount of energy emitted by the crystal, it is preferred that the lens aperture be greater than the crystal diameter. With reference to FIG. 4, the lens can be constructed with a spherical cutter, for example, to have a selected focal distance Z_0. It is preferred that Z_0=0.125 inch or 3.175 mm. This yields an f-value ($f=Z_0/D$) equal to four (4), where D is the diameter of the active area of the piezoelectric material. It is preferred that the radius of curvature of the lens be chosen to provide an f-value in the range of about 1 to 4. In another aspect of this embodiment, the f-value is in the range of 1-2. In yet another aspect of this embodiment, the f-value is in the range of 2-4." [0047] "To efficiently capture the energy in the acoustic wave generated by the piezoelectric crystal, it is desirable that the diameter of the lens be greater than the diameter of the active portion of the piezoelectric crystal. Thus, in view of the preferred active crystal diameter of 0.039 inches or 0.99 mm, the presently preferred value for the radius of the lens (a) is about 0.016 inch or 0.40 mm (see FIG. 4). In a typical embodiment, the focal distance of the lens may be approximately equal to 2.5 to 3 times the diameter of the crystal." [0048] "By virtue of having an f-value in the range of 1-4, a relatively long focal length (d_z) results. Consequently, the acoustic deposition emitter is functional over a wide range of depths of source pool. In this manner, refocusing of the emitter is not required every time the depth of a particular sample pool is altered by the ejection of some material therefrom. Nonetheless, in an alternative embodiment of the present invention, adjusting the focus of the acoustic beam is contemplated. Such adjustment may be made by varying the distance between the acoustic deposition emitter and the surface of the pool of source fluid. Any methods useful for varying the distance between the acoustic deposition emitter and the surface of the pool of source fluid are contemplated for use in the practice of the present invention. Focussing may be automated and controlled by computer."
2.	The device of claim 1, further comprising: (c) a means for positioning the ejector (i) in acoustic coupling relationship to the reservoir.	[0057] "Because these methods may be employed in high throughput applications, it is preferred that methods of the invention further comprise user-defined positioning of the acoustic liquid deposition emitter relative to an array of source wells, thus providing for user-defined association of the acoustic liquid deposition emitter with a selected pool of source fluid for ejection of a droplet therefrom. This can be accomplished by a variety of methods. For example, in the case where a multi-well plate is employed as the source fluid containment structure, a computer-controlled translator (e.g., an actuator, or the like) can manipulate the position of the multi-well plate or a movable stage upon which the multiwell plate rests. Thus, a selected well or a selected succession of wells is placed over the acoustic deposition emitter, as the source fluid contained in each well is needed for the application being conducted (e.g., oligonucleotide synthesis, or the like). In a related embodiment, the acoustic deposition emitter may be moved rather than the source

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		plate. For example, the source fluid containment structure may remain fixed in position and the acoustic liquid deposition emitter may be moved relative to a well or particular source fluid of interest contained in or on the source fluid containment structure. In yet another embodiment, multiple deposition emitters may be utilized each associated, for example, with a source fluid pool. In this embodiment, neither the source fluid containment structure nor the deposition emitter are moved but rather the deposition emitters are selectively activated depending upon which source fluid is desired to have at least one droplet ejected there from. Once again, this allows for the selective association of the emitter with a selected source pool. Accordingly, a source fluid array having a plurality of different source fluid materials may have droplets selectively ejected from a particular source fluid towards, for example, a target."
3.	The device of claim 2, comprising a plurality of reservoirs each adapted to contain a fluid, and wherein the device is capable of ejecting a fluid droplet from each of the plurality of reservoirs toward a plurality of designated sites on the substrate surface.	See claim 2 above.
4.	The device of claim 3, wherein each of the reservoirs is removable from the device.	[0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)." [0057] "Because these methods may be employed in high throughput applications, it is preferred that methods of the invention further comprise user-defined positioning of the acoustic liquid deposition emitter relative to an array of source wells, thus providing for user-defined association of the acoustic liquid deposition emitter with a selected pool of source fluid for ejection of a droplet therefrom. This can be accomplished by a variety of methods. For example, in the case where a multi-well plate is employed as the source fluid containment structure, a computer-controlled translator (e.g., an actuator, or the like) can manipulate the position of the multi-well plate or a movable stage upon which the multiwell plate rests."
5.	The device of claim 3, wherein each reservoir comprises an individual well in a	[0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region

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	well plate.	can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)."
6.	The device of claim 5, wherein the well plate contains at least 96 wells.	See claim 5 above.
7.	The device of claim 5, wherein the well plate contains between about 96 to about 1500 reservoirs.	See claim 5 above.
8.	The device of claim 5, wherein the well plate contains at least 1536 wells.	See claim 5 above.
9.	The device of claim 5, wherein the well plate contains thousands of wells.	[0004] "Current biotechnology screening techniques may involve many thousands of separate screening operations, with the concomitant need for many thousands of fluid transfer operations in which small volumes of fluid are transferred from a fluid source (e.g., a multi-well plate comprising, for example, a library of test compounds) to a target (e.g., a site where a test compound is contacted with a defined set of components). Thus, not only the source, but also the target may comprise thousands of loci that need to be accessed in a rapid, contamination-free manner." [0009] "The methods of the invention are easily automated in a manner that provides for the processing of many different sources of fluid from an array of pools of source fluid, and further provides for an array of target sites to receive the micro-droplets of source fluid as they are ejected from the pools of source fluid. In this manner thousands of individual samples of source fluid can be processed and directed to the same or two or more (e.g., a thousands or more) separate target sites for further reaction, detection, and the like." [0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog

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		number 3950 available from Corning Corporation)."
10.	The device of claim 5, wherein the well plate contains many thousands of reservoirs.	See claim 9 above.
11.	The device of claim 3, wherein the reservoirs are arranged in an array.	[0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)." [0073] "The methods of the invention may also be employed in synthesis reactions. For example, in another embodiment of the present invention, employing monomeric and/or multimeric nucleotides as source compounds can be employed to synthesize oligonucleotides (useful as probes, labels, primers, anti-sense molecules, and the like). Such source compounds may be present in a fluid medium (i.e., source fluid) and each source fluid placed in a defined position of an array on the source containment structure. By ejecting source nucleotides from the source containment structure onto a defined target zone of the target, defined nucleotides can be added to a growing product oligonucleotide chain in an additive manner that serves to define the nucleotide sequence of the growing product oligonucleotide."
12.	The device of claim 3, wherein the reservoirs are substantially acoustically indistinguishable.	[0030] "Source fluid containment structures may be constructed of any suitable material, bearing in mind the need for good acoustic velocity properties. Such materials include glass, polymer (e.g., polystyrene), metal, a textured material, a containment field, and the like, as well as combinations thereof The material may further be porous or non-porous, or combinations thereof." [0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)."

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13.	The device of claim 3, wherein the reservoirs comprise a portion of a micro-titer plate.	See claim 12 above.
14.	The device of claim 3, wherein at least one of the reservoirs is adapted to contain no more than about 2000 nanoliters of fluid.	[0032] "The methods of the invention are contemplated for use in high throughput operations. It is preferred that the source fluid containment structure have multiple containment regions, preferably in an array which can be mapped so that each containment region can be accessed under direction of a controlling computer. Thus, in one preferred embodiment of the present invention, the source fluid containment structure is a multi-well plate such as a micro-titer plate (comprising a plurality of wells, each having a bottom, sides and an open top for the ejection of a droplet there through). Suitable micro-titer plates may have from about 96 to about 1500 wells, or more. One example of a suitable plate is a 1536 well plate (e.g., catalog number 3950 available from Corning Corporation)."
15.	The device of claim 3, wherein at least one reservoir contains a fluid.	[0028] "As used herein, 'source fluid containment structure' is any structure suitable for containing or supporting a pool of source fluid and which allows an acoustic wave to propagate from a first side or end of the structure, through the structure to the second side or end of the structure, wherein the source fluid is contained on the second side or within the structure. Thus, suitable source fluid containment structures include a flat structure such as a slide (e.g., a glass or polystyrene microscope slide), or the like, onto which one or more discrete pools of source fluid may be deposited; also included are single and multi-well plates commonly used in molecular biology applications; capillaries (e.g., capillary arrays); and the like."
16.	The device of claim 15, wherein each reservoir contains a different fluid.	[0027] "Any type of fluid is suitable for use in the practice of the present invention. As used herein, 'fluid' means an aggregate of matter in which the molecules are able to flow past each other without limit and without the formation of fracture planes. Thus, as recognized by those of skill in the art, a fluid may comprise a liquid and/or a gas under the appropriate conditions. A fluid may be homogenous, i.e., one component, or heterogeneous, i.e., more than one component. Where a plurality of pools of source fluid are employed in the practice of the present invention, each pool may comprise a different source fluid, as further described herein."
17.	The device of claim 15, wherein at least one of the reservoirs contains an aqueous fluid.	[0031] "Source fluid containment structures may have one or more coatings to facilitate fluid containment. Thus, in one embodiment of the present invention, slides having zones of relative hydrophobicity and hydrophilicity may be employed as source fluid containment structures. In this manner, an aqueous fluid may be applied to a zone of the slide that is surrounded by a relatively hydrophobic region (or coating of relatively hydrophilic material), thereby operating to contain a pool of source fluid. Reference is made to FIG. 3 as one example of this embodiment of the present invention. Source fluid containment structure 30 has zones or regions (i.e., containment zones) for containing discrete pools of source fluid 40. These zones are defined by a coating of a hydrophobic material 80 which acts to confine the source fluid 40 in the containment zones. Accordingly, in

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		this embodiment of the present invention, sample wells are not required to contain the discrete pools of source fluid. Examples of hydrophobic coatings include polytetratfluoroethylene (PTFE), hydrophobic amino acids, polypeptides comprising hydrophobic amino acids, waxes, oils, fatty acids, and the like. Those of skill in the art can readily determine a number of other hydrophobic coatings, which may also serve to define source fluid containment zones, and contain source fluids therein. Optionally, the zone(s) of the slide which are chosen to contain non-aqueous source fluid may have relatively hydrophilic regions (or coating of relatively hydrophilic material) to further define the containment zone(s). Thus, pools of source fluid can be confined to defined areas of a slide by virtue of the relative areas of hydrophobicity and hydrophilicity. Again, sample wells are not required to contain a pool of source fluid."
18.	The device of claim 15, wherein at least one of the reservoirs contains a nonaqueous fluid.	See claim 17 above.
19.	The device of claim 15, wherein at least one of the reservoirs contains two substantially immiscible fluids.	[0027] "Any type of fluid is suitable for use in the practice of the present invention. As used herein, 'fluid' means an aggregate of matter in which the molecules are able to flow past each other without limit and without the formation of fracture planes. Thus, as recognized by those of skill in the art, a fluid may comprise a liquid and/or a gas under the appropriate conditions. A fluid may be homogenous, i.e., one component, or heterogeneous, i.e., more than one component." [0029] "Maintaining discrete pools of source fluid may be accomplished by a variety of methods, including providing a plurality of separation structures such as wells, tubes or other devices that have at least one wall separating one fluid from another, or by providing coatings that serve to define containment regions (as further described herein), and the like. Immiscible fluids or materials can be used to separate dissimilar fluids (e.g., waxy coatings separating hydrophilic fluids) forming containment fields."
20.	The device of claim 18, wherein the nonaqueous fluid comprises an organic solvent.	[0031] "Source fluid containment structures may have one or more coatings to facilitate fluid containment. Thus, in one embodiment of the present invention, slides having zones of relative hydrophobicity and hydrophilicity may be employed as source fluid containment structures. In this manner, an aqueous fluid may be applied to a zone of the slide that is surrounded by a relatively hydrophobic region (or coating of relatively hydrophilic material), thereby operating to contain a pool of source fluid. Reference is made to FIG. 3 as one example of this embodiment of the present invention. Source fluid containment structure 30 has zones or regions (i.e., containment zones) for containing discrete pools of source fluid 40. These zones are defined by a coating of a hydrophobic material 80 which acts to confine the source fluid 40 in the containment zones. Accordingly, in this embodiment of the present invention, sample wells are not required to contain the discrete pools of source fluid. Examples of

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		hydrophobic coatings include polytetratfluoroethylene (PTFE), hydrophobic amino acids, polypeptides comprising hydrophobic amino acids, waxes, oils, fatty acids, and the like. Those of skill in the art can readily determine a number of other hydrophobic coatings, which may also serve to define source fluid containment zones, and contain source fluids therein. Optionally, the zone(s) of the slide which are chosen to contain non-aqueous source fluid may have relatively hydrophilic regions (or coating of relatively hydrophilic material) to further define the containment zone(s). Thus, pools of source fluid can be confined to defined areas of a slide by virtue of the relative areas of hydrophobicity and hydrophilicity. Again, sample wells are not required to contain a pool of source fluid." [0063] "'Chemical compounds' contemplated for use in the practice of the present invention may comprise any compound that does not fall under the definition of biological compounds as used herein. Specific chemical compounds contemplated for use in the practice of the present invention includes dyes, detectable labels, non-enzyme chemical reagents, dilutents, and the like."
21.	The device of claim 18, wherein the nonaqueous fluid comprises a non-biological fluid.	See claim 20 above.
22.	The device of claim 15, wherein at least one of the fluid containing reservoirs contains a biomolecule.	[0059] "Source fluids contemplated for use in the practice of the present invention may comprise one or more source materials. Source materials may include both biological and chemical compounds, agents and life forms (e.g., plant cells, eukaryotic or prokaryotic cells)." [0060] "As used herein, 'biological compounds' may comprise nucleic acids (e.g., polynucleotides), peptides and polypeptides (including antibodies and fragments of antibodies), carbohydrates (e.g., oligosaccharides), and combinations thereof. In some embodiments, cells (e.g., eukaryotic or prokaryotic) may be contained in the fluid. Such an embodiment would allow for the transfer of organisms from one source fluid to another fluid or target during cell culturing or sorting."
23.	The device of claim 15, wherein at least one of the fluid containing reservoirs contains a chemical or biological compound.	See claim 22 above.
24.	The device of claim 23, wherein the biomolecule is selected from the group consisting of nucleotides, peptides, oligomers, and polymers.	[0061] "The term 'polynucleotides' and 'oligonucleotides' include two or more nucleotide bases (e.g., deoxyribonucleic acids or ribonucleic acids) linked by a phosphodiester bond." [0062] "Polypeptides contemplated for use in the practice of the present invention includes two or more amino acids joined to one another by peptide bonds. Thus, polypeptides include proteins (e.g.,

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		enzymes (e.g., DNA polymerase), structural proteins (e.g., keratin), antibodies, fragments thereof, and the like), prions, and the like." [0073] "The methods of the invention may also be employed in synthesis reactions. For example, in another embodiment of the present invention, employing monomeric and/or multimeric nucleotides as source compounds can be employed to synthesize oligonucleotides (useful as probes, labels, primers, anti-sense molecules, and the like). Such source compounds may be present in a fluid medium (i.e., source fluid) and each source fluid placed in a defined position of an array on the source containment structure. By ejecting source nucleotides from the source containment structure onto a defined target zone of the target, defined nucleotides can be added to a growing product oligonucleotide chain in an additive manner that serves to define the nucleotide sequence of the growing product oligonucleotide."
25.	The device of claim 23, wherein the biomolecule is attached to a cell.	[0069] "In one embodiment, the methods of the present invention may be used to pair certain ligands (i.e., a molecular group that binds to another entity to form a larger more complex entity) and binding partners for such ligands. For example, certain biological molecules are known to interact and bind to other molecules in a very specific manner. Essentially any molecules having a high binding specificity or affinity for each other can be considered a ligand/binding partner pair, e.g., a vitamin binding to a protein, a hormone binding to a cell-surface receptor, a drug binding to a cell-surface receptor, a glycoprotein serving to identify a particular cell to its neighbors, an antibody (e.g., IgG-class) binding to an antigenic determinant, an oligonucleotide sequence binding to its complementary fragment of RNA or DNA, and the like."
26.	The device of claim 3, wherein the positioning means is adapted to repeatedly reposition the ejector so to enable ejection of a droplet from each of the reservoirs.	[0057] "Because these methods may be employed in high throughput applications, it is preferred that methods of the invention further comprise user-defined positioning of the acoustic liquid deposition emitter relative to an array of source wells, thus providing for user-defined association of the acoustic liquid deposition emitter with a selected pool of source fluid for ejection of a droplet therefrom. This can be accomplished by a variety of methods. For example, in the case where a multi-well plate is employed as the source fluid containment structure, a computer-controlled translator (e.g., an actuator, or the like) can manipulate the position of the multi-well plate or a movable stage upon which the multiwell plate rests. Thus, a selected well or a selected succession of wells is placed over the acoustic deposition emitter, as the source fluid contained in each well is needed for the application being conducted (e.g., oligonucleotide synthesis, or the like). In a related embodiment, the acoustic deposition emitter may be moved rather than the source plate. For example, the source fluid containment structure may remain fixed in position and the acoustic liquid deposition emitter may be moved relative to a well or particular source fluid of interest contained in or on the source fluid containment structure. In yet another embodiment, multiple deposition emitters may be utilized each associated, for example, with a source fluid pool. In this embodiment, neither the source fluid containment structure nor the

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		deposition emitter are moved but rather the deposition emitters are selectively activated depending upon which source fluid is desired to have at least one droplet ejected there from. Once again, this allows for the selective association of the emitter with a selected source pool. Accordingly, a source fluid array having a plurality of different source fluid materials may have droplets selectively ejected from a particular source fluid towards, for example, a target."
27.	The device of claim 26, further comprising a substrate positioning means for positioning the substrate surface with respect to the ejector.	[0058] "The target may comprise an array of target zones or target spots to which source fluid is directed. As described above, with respect to the source fluid and acoustic deposition emitter, the target may also be moveable relative to a source fluid. For example, the target may be moved relative to a source fluid to be ejected thereby allowing for selected receipt at the target of a desired ejected source fluid droplet. The target may be positioned so that each target zone can be selectively positioned over the selected pool of source fluid. A computer controlled actuator arm, or the like can accomplish positioning of the target. It is presently preferred that both the target and the source fluid containment structure be positionable via separate computer-controlled actuators. Thus, the non-contact fluid transfer/deposition technology described herein provides for precise targeting of individual source fluids to selected target zones."
28.	The device of claim 3, further comprising a means for maintaining a fluid in each reservoir at a constant temperature.	[0056] "Thus, by providing a coupling medium between the acoustic wave deposition emitter or preferably the acoustic wave channel and the fluid containment structure, a far more efficient transfer of energy occurs than if no coupling medium is employed. In one aspect of the invention, the coupling medium is temperature controlled to minimize any effect of temperature on the source fluid."
29.	The device of claim 3, further comprising a temperature controlled coupling fluid provided between the ejector and each reservoir.	See claim 28 above.
30.	The device of claim 3, comprising a single ejector.	See claim 28 above.
31.	The device of claim 2, wherein the acoustic coupling relationship comprises positioning the ejector such that the acoustic radiation is generated and focused external to the reservoir.	See Figures 1-6. [0021] "In accordance with the present invention, there is provided an apparatus useful for non-contact fluid transfer. With reference to FIG. 1 there is schematically presented one embodiment of an apparatus of the present invention. The figure depicts a non-contact fluid transfer apparatus 5 having at least one acoustic liquid deposition emitter 60 in electrical communication with a computer 95. During operation the acoustic liquid deposition emitter 60 generates an acoustic wave or beam 10 that can be propagated through an optional wave channel 70. The acoustic wave can be focused by lens 75 prior to propagating through coupling fluid 20 to optimize the energy of the acoustic wave or beam 10 upon the

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		liquid/air interface of source fluid 40. The acoustic wave 10 is propagated through a coupling medium 20 after which the wave is transmitted through source fluid containment structure 30 where the wave comes to focus at or near the surface of a pool of source fluid 40 thereby causing ejection of at least one droplet 50 of source fluid from the surface of the pool."
32.	The device of claim 31, wherein the acoustic coupling relationship between the ejector and the fluid in the reservoir is established by providing an acoustically conductive medium between the ejector and the reservoir.	See claim 31 above.
33.	The device of claim 1, wherein said f-value is greater than approximately 3.	[0046] "To capture the maximum amount of energy emitted by the crystal, it is preferred that the lens aperture be greater than the crystal diameter. With reference to FIG. 4, the lens can be constructed with a spherical cutter, for example, to have a selected focal distance Z_0. It is preferred that Z_0=0.125 inch or 3.175 mm. This yields an f-value ($f=Z_0/D$) equal to four (4), where D is the diameter of the active area of the piezoelectric material. It is preferred that the radius of curvature of the lens be chosen to provide an f-value in the range of about 1 to 4. In another aspect of this embodiment, the f-value is in the range of 1-2. In yet another aspect of this embodiment, the f-value is in the range of 2-4." [0047] "To efficiently capture the energy in the acoustic wave generated by the piezoelectric crystal, it is desirable that the diameter of the lens be greater than the diameter of the active portion of the piezoelectric crystal. Thus, in view of the preferred active crystal diameter of 0.039 inches or 0.99 mm, the presently preferred value for the radius of the lens (a) is about 0.016 inch or 0.40 mm (see FIG. 4). In a typical embodiment, the focal distance of the lens may be approximately equal to 2.5 to 3 times the diameter of the crystal." [0048] "By virtue of having an f-value in the range of 1-4, a relatively long focal length (d_z) results. Consequently, the acoustic deposition emitter is functional over a wide range of depths of source pool. In this manner, refocusing of the emitter is not required every time the depth of a particular sample pool is altered by the ejection of some material therefrom. Nonetheless, in an alternative embodiment of the present invention, adjusting the focus of the acoustic beam is contemplated. Such adjustment may be made by varying the distance between the acoustic deposition emitter and the surface of the pool of source fluid. Any methods useful for varying the distance between the acoustic deposition emitter and the surface of the pool of source fluid are contemplated for use in the practice of the present invention. Focussing may be automated and controlled by computer."
34.	The device of claim 1,	See claim 33 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	wherein said f-value is no more than 4.	
35.	The device of claim 1, wherein said f-value is in the range of approximately 2.5 to approximately 3.	See claim 33 above.
36.	The device of claim 1, wherein said f-value is approximately 4.	See claim 33 above.
37.	The device of claim 1, comprising more than one thousand reservoirs.	See claim 9 above.
38.	The device of claim 1, comprising thousands of reservoirs.	See claim 9 above.
39.	The device of claim 1, comprising many thousands of reservoirs.	See claim 9 above.
40.	The device of claim 1, further comprising cooling means for lowering the temperature of the substrate surface.	[0076] "In a further embodiment of the present invention, there are provided methods for determining or confirming the nucleotide sequence of an 'unknown' polynucleotide. The polynucleotide may be labeled by conventional methods (e.g., fluorescent, magnetic or nuclear) and then contacted with target oligonucleotides of known sequence that have previously been bound to an array of sites on the target using the methods of the invention (i.e., ejection of the known oligonucleotide from a source pool to a desired target zone on the target array). Indeed, the target oligonucleotides may be synthesized in situ on the target array using methods described herein. Following contacting of the 'unknown' polynucleotide with the target array of oligonucleotides, the target array is washed at the appropriate stringency and the presence and location of hybridized-labeled polynucleotide is determined using scanning analyzers or the like."
41.	A method for ejecting a fluid from a fluid reservoir toward designated sites on a substrate surface, comprising: (a) providing a device comprised of: (i) a reservoir containing a first fluid and enabling conduction of acoustic energy in a substantially uniform manner, and	See claim 1 above.

Claim #	Claim Limitati n	Support in Applicants' Disclosure
	(ii) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a lens capable of focusing the generated acoustic radiation to emit a droplet from a surface of the first fluid contained within the fluid reservoir, said ejector having an f-value of greater than 2;…	
	…(b) positioning the ejector so as to be in acoustically coupled relationship to the fluid-containing reservoir;…	See claim 2 above.
	…(c) activating the ejector to generate acoustic radiation, thereby ejecting a droplet of the first fluid from the reservoir.	See claim 1 above.
42.	The method of claim 41, wherein said f-value is greater than approximately 3.	See claim 33 above.
43.	The device of claim 41, wherein said f-value is in the range of approximately 2.5 to approximately 3.	See claim 33 above.
44.	The method of claim 41, wherein said f-value is no more than 4.	See claim 33 above.
45.	The method of claim 41, wherein said f-value is approximately 4.	See claim 33 above.
46.	The method of claim 41, wherein the ejected droplet has a diameter less than the diameter of a focal spot of the acoustic radiation at the surface of the first fluid.	[0036] "The radiation pressure is greatest in the acoustic wave or beam's focal region, particularly, at the pool surface where wave reflection occurs. The pressure caused by the acoustic wave or beam acts to lift a small column of liquid which appears initially as a small mound. When enough energy is applied to overcome surface tension the mound becomes a momentary liquid fountain where each tone burst emits a single droplet. Because the focused wave or beam is diffraction limited, the droplet diameter is proportional to the wavelength. Observations with water indicate that single droplet ejection occurs at a specific power level band where uniformly sized droplets form. However above this band, as one increases power level further the droplets begin to form tails which then break off into satellite droplets. Further increases in power causes the process

Claim #	Claim Limitation	Support in Applicants' Discl sure
		to transition to a continuous fountain." [0037] "At energy levels just below the threshold of normal droplet ejection, a fine mist may be emitted from the source fluid. The mist may be used in situations where it is desirable to coat a surface with fine droplet coating that is 1/10 to 1/100 the size of the normally produced droplets."
47.	The method of claim 46, wherein two droplets are ejected during step (c).	See claim 46 above.
48.	The method of claim 47, wherein the two ejected droplets are deposited as first and second droplets and the second droplet is larger than the first droplet.	See claim 46 above.
49.	The method of claim 47, wherein each of the ejected droplets has a width less than the diameter of the focal spot.	See claim 46 above.
50.	The method of claim 41, wherein the device comprises a plurality of reservoirs each adapted to contain a fluid, and wherein the device is capable of ejecting a fluid droplet from each of the plurality of reservoirs toward a plurality of designated sites on the substrate surface and the method further comprises:…	See claim 3 above.
	…(d) positioning the ejector so as to be in acoustically coupled relationship to a second fluid-containing reservoir containing a second fluid; and …	See claim 2 above.
	…(e) activating the ejector as in step (b) to eject a droplet of the second fluid from the second reservoir toward a second designated site on the substrate surface.	See claim 3 above.
51.	The method of claim 50, wherein each of the ejected droplets of the first fluid and second fluids has a width less than the diameter of a focal spot	See claim 46 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	of the acoustic radiation at the surface of the first fluid.	
52.	The method of claim 50, wherein two droplets are ejected during at least one of steps (c) or (e).	See claim 46 above.
53.	The method of claim 52, wherein each of the two droplets ejected during step (c) or (e) has a width less than the diameter of a focal spot of the acoustic radiation at the surface of the first fluid.	See claim 46 above.
54.	The method of claim 52, wherein at least two ejected droplets are deposited at the same designated site on the substrate surface.	[0009] "The methods of the invention are easily automated in a manner that provides for the processing of many different sources of fluid from an array of pools of source fluid, and further provides for an array of target sites to receive the micro-droplets of source fluid as they are ejected from the pools of source fluid. In this manner thousands of individual samples of source fluid can be processed and directed to the same or two or more (e.g., a thousands or more) separate target sites for further reaction, detection, and the like."
55.	The method of claim 54, wherein the two ejected droplets are deposited as first and second droplets and the second droplet is larger than the first droplet.	See claim 46 above.
56.	The method of claim 50, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet size and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet of the desired size.	[0041] "Accordingly, to eject individual droplets from the source fluid containment structure on demand, the RF excitation of the piezoelectric element is amplitude or frequency modulated (by means well understood to those of skill in the art), thereby causing the focused acoustic beam radiation pressure exerted against the surface of the source pool of fluid to swing above and below a predetermined droplet ejection threshold level. Thus, the RF voltage applied to the piezoelectric element may be amplitude or frequency modulated and/or energy duration modulated to control the droplet ejection process. In a preferred embodiment, the RF excitation voltage is computer controlled and may be changed to account for changes in the viscosity and surface tension of the source fluid." [0042] "In one embodiment, a computer sends an analog voltage pulse to the piezoelectric transducer by an electrical wire. The voltage pulse can be controlled, for example, by a MD-E-201 Drive Electronics manufactured by Microdrop, GmbH, Muhlenweg 143, D-22844 Norderstedt, Germany. The electronics can thus control the magnitude and duration of the analog voltage pulses, and also the frequency at which the pulses are sent to the piezoelectric transducer. Each voltage pulse causes the generation of an acoustic wave from the piezoelectric transducer, which in turn is propagated

Claim #	Claim Limitation	Support in Applicants' Disclosure
		through a coupling medium and into or through the source fluid thereby impinging on the surface of the source fluid. For example, an acoustic wave (e.g., a pressure wave) propagates through the coupling medium and source fluid where one droplet of source fluid is emitted under high acceleration. The size of these droplets has been shown to be very reproducible. The high acceleration of the source fluid minimizes or eliminates problems caused by source fluid surface tension and viscosity, allowing extremely small droplets to be expelled from the surface of a pool of source fluid, e.g., as small as 5 picoliter droplets have been demonstrated." [0052] "The size of the droplet can also be adjusted by modulating one or more of frequency, voltage, and duration of the energy source used to excite the acoustic liquid deposition emitter (e.g., a piezoelectric transducer). Accordingly, a wide range of user-defined droplet diameters can be achieved by employing the methods of the invention."
57.	The method of claim 50, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet velocity and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet at the desired droplet velocity.	See claim 56 above.
58.	The method of claim 50, further comprising repeating steps (d) and (e) with one or more additional fluid-containing reservoirs.	See claims 2 and 3 above.
59.	The method of claim 50, wherein each of the ejected droplets has a volume of 5 pL.	[0042] "The high acceleration of the source fluid minimizes or eliminates problems caused by source fluid surface tension and viscosity, allowing extremely small droplets to be expelled from the surface of a pool of source fluid, e.g., as small as 5 picoliter droplets have been demonstrated." [0052] "The size of the droplet can also be adjusted by modulating one or more of frequency, voltage, and duration of the energy source used to excite the acoustic liquid deposition emitter (e.g., a piezoelectric transducer). Accordingly, a wide range of user-defined droplet diameters can be achieved by employing the methods of the invention. In one embodiment of the present invention, the defined droplet diameter is at least about 1 micrometer. In another embodiment of the present invention, the defined droplet diameter is in the range of about 1 micrometer to about 10,000 micrometers. In yet another embodiment of the present invention, the defined droplet

Claim #	Claim Limitation	Support in Applicants' Disclosure
		diameter is in the range of about 500 micrometers to about 1000 micrometers. In a further embodiment of the present invention, the defined droplet diameter is in the range of about 60 micrometers to about 500 micrometers. In yet another embodiment of the present invention, the defined droplet diameter is in the range of about 100 micrometers to about 500 micrometers. In another embodiment of the present invention, the defined droplet diameter is in the range of about 120 micrometers to about 250 micrometers. In a further embodiment of the present invention, the defined droplet diameter is in the range of about 30 micrometers to about 60 micrometers. In still another embodiment of the present invention, the defined droplet diameter is about 50 micrometers."
60.	The method of claim 50, wherein each of the ejected droplets has a diameter in the range of about 30 micrometers to about 60 micrometers.	See claim 59 above.
61.	The method of claim 50, wherein each of the ejected droplets has a diameter in the range of about 120 micrometers to about 250 micrometers.	See claim 59 above.
62.	The method of claim 50, wherein each of the ejected droplets has a diameter in the range of about 60 micrometers to about 500 micrometers.	See claim 59 above.
63.	The method of claim 50, wherein each of the ejected droplets has a diameter in the range of about 500 micrometers to about 1,000 micrometers.	See claim 59 above.
64.	The method of claim 50, wherein each of the ejected droplets has a diameter in the range of about 1 micrometer to about 10,000 micrometers.	See claim 59 above.
65.	The method of claim 50, wherein each of the ejected droplets has a diameter of less than about 10,000 micrometers.	See claim 59 above.
66.	The method of claim 50, further comprising, before each ejector activation step, measuring the fluid level in the reservoir in acoustically coupled	[0077] "In performing the methods of the invention, the volume of each of the source pools is depleted as material is ejected from them. Thus, it is desirable to monitor the volume or level of each source pool to ensure fluid is available. The volume of level of source fluid is also important because the impinging acoustic wave or beam will

[redacted]

Claim #	Claim Limitation	Support in Applicants' Disclosure
	relationship with the ejector.	eject droplets from the surface of the source pool most efficiently if the beam is focused as nearly as possible on the surface of the pool. Thus, by monitoring the volume or level of the source pool, the focus of the acoustic wave or beam can be adjusted (e.g., by adjusting the distance between the acoustic deposition emitter the source fluid containment structure)." [0078] "Accordingly, in a further embodiment the invention provides a method for detecting the amount of source fluid remaining in a source pool. Fluid volume or level detection may be performed by a variety of methods including direct visual/optical inspection, indirect measurement, and the like. In one aspect of this embodiment, detecting is performed by optically observing a change in the source fluid volume or level as a result of ejecting said droplet from said pool. In this aspect, optical observation may be performed by an optical detector coupled to a computer, wherein the computer computes a change in volume or level based on signals received from the optical detector before ejection of a droplet, and after the ejection of a droplet." [0079] "Optical detectors contemplated for use in the practice of the present invention may include a camera, a photoelectric cell, and the like. For example, a laser or other light source can be directed at the surface of a source pool and the detraction angle determined by one or more photoelectric cells coupled to a computer. The angle can thus indicate the level of fluid in the source pool, and from there, the volume can readily be computed. Other optical detection methods known to those of skill in the art or developed in the future may also be employed in this aspect of the present invention." [0080] "In another aspect of the invention, detection of the fluid level (volume and/or height) may be by observing the acoustic reflection properties of the pool of source fluid. For example, by detecting the reflection of the acoustic beam employed to eject the droplet from the surface, the volume can be computed based on empirically determined acoustic reflection characteristics. Since the acoustic liquid deposition emitter (e.g., a piezoelectric transducer) design is similar with acoustic measuring devices the droplet generator's transducer may also be used for acoustic depth sensing as a means of pool level or volume feedback measurement. The signal can be processed and the system can then be adjusted to further focus the acoustic wave or beam as the level or volume changes. In another aspect of this embodiment, a secondary piezoelectric transducer can be employed to generate the acoustic beam employed to detect the fluid level. The secondary piezoelectric transducer may be torroidal and disposed around the perimeter of the piezoelectric transducer used to eject the droplet of fluid (i.e., the primary transducer). One example of this embodiment is depicted in FIG. 5, which shows two options for deploying a secondary piezoelectric transducer. For example, a torroidal secondary transducer 65 may be disposed around the perimeter of the primary piezoelectric transducer 60. In another aspect, a non-torroidal secondary transducer 65' may be employed to generate the acoustic wave used to gauge fluid level. Other deployments of the second

Claim #	Claim Limitation	Support in Applicants' Disclosure
		piezoelectric transducer may also be employed in the practice of the present invention."
67.	The method of claim 66, wherein each measuring step is carried out acoustically.	See claim 66 above.
68.	The method of claim 67, wherein each measuring step is carried out using acoustic radiation from the ejector.	See claim 66 above.
69.	The method of claim 41, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet size and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet of the desired size.	See claim 56 above.
70.	The method of claim 41, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet velocity and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet at the desired droplet velocity.	See claim 56 above.
71.	A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising: (a) a reservoir adapted to contain a fluid and having an aperture that enables conduction of acoustic energy in a substantially uniform manner, said aperture having a selected cross-sectional width; and (b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation	See claim 1 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	and a focusing means capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir said surface being an effective distance from the aperture, wherein the ratio of the effective distance to the cross-sectional width of the aperture is greater than about 2:1.	
72.	The device of claim 71, further comprising: (c) a means for positioning the ejector (i) in acoustic coupling relationship to the reservoir.	See claim 2 above.
73.	The device of claim 72, comprising a plurality of reservoirs each adapted to contain a fluid, and wherein the device is capable of ejecting a fluid droplet from each of the plurality of reservoirs toward a plurality of designated sites on the substrate surface.	See claim 2 above.
74.	The device of claim 73, wherein each of the reservoirs is removable from the device.	See claim 4 above.
75.	The device of claim 73, wherein each reservoir comprises an individual well in a well plate.	See claim 5 above.
76.	The device of claim 75, wherein the well plate contains at least 96 wells.	See claim 5 above.
77.	The device of claim 75, wherein the well plate contains between about 96 to about 1500 reservoirs.	See claim 5 above.
78.	The device of claim 75, wherein the well plate contains at least 1536 wells.	See claim 5 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
79.	The device of claim 75, wherein the well plate contains thousands of wells.	See claim 9 above.
80.	The device of claim 75, wherein the well plate contains many thousands of reservoirs.	See claim 9 above.
81.	The device of claim 73, wherein the reservoirs are arranged in an array.	See claim 11 above.
82.	The device of claim 73, wherein the reservoirs are substantially acoustically indistinguishable.	See claim 12 above.
83.	The device of claim 73, wherein the reservoirs comprise a portion of a micro-titer plate.	See claim 12 above.
84.	The device of claim 73, wherein at least one of the reservoirs is adapted to contain no more than about 2000 nanoliters of fluid.	See claim 14 above.
85.	The device of claim 73, wherein at least one reservoir contains a fluid.	See claim 15 above.
86.	The device of claim 85, wherein each reservoir contains a different fluid.	See claim 16 above.
87.	The device of claim 85, wherein at least one of the reservoirs contains an aqueous fluid.	See claim 17 above.
88.	The device of claim 85, wherein at least one of the reservoirs contains a nonaqueous fluid.	See claim 17 above.
89.	The device of claim 85, wherein at least one of the reservoirs contains two substantially immiscible fluids.	See claim 19 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
90.	The device of claim 89, wherein the nonaqueous fluid comprises an organic solvent.	See claim 20 above.
91.	The device of claim 89, wherein the nonaqueous fluid comprises a non-biological fluid.	See claim 20 above.
92.	The device of claim 85, wherein at least one of the fluid containing reservoirs contains a biomolecule.	See claim 22 above.
93.	The device of claim 85, wherein at least one of the fluid containing reservoirs contains a chemical or biological compound.	See claim 22 above.
94.	The device of claim 92, wherein the biomolecule is selected from the group consisting of nucleotides, peptides, oligomers, and polymers.	See claim 24 above.
95.	The device of claim 92, wherein the biomolecule is attached to a cell.	See claim 25 above.
96.	The device of claim 73, wherein the positioning means is adapted to repeatedly reposition the ejector so to enable ejection of a droplet from each of the reservoirs.	See claim 26 above.
97.	The device of claim 96, further comprising a substrate positioning means for positioning the substrate surface with respect to the ejector.	See claim 27 above.
98.	The device of claim 73, further comprising a means for maintaining a fluid in each reservoir at a constant temperature.	See claim 28 above.
99.	The device of claim 73, further comprising a temperature	See claim 28 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	controlled coupling fluid provided between the ejector and each reservoir.	
100.	The device of claim 73, comprising a single ejector.	See claim 28 above.
101.	The device of claim 72, wherein the acoustic coupling relationship comprises positioning the ejector such that the acoustic radiation is generated and focused external to the reservoir.	See claim 31 above.
102.	The device of claim 101, wherein the acoustic coupling relationship between the ejector and the fluid in the reservoir is established by providing an acoustically conductive medium between the ejector and the reservoir.	See claim 31 above.
103.	The device of claim 71, wherein said ratio is greater than approximately 3:1.	See claim 33 above.
104.	The device of claim 71, wherein said ratio is no more than 4:1.	See claim 33 above.
105.	The device of claim 71, wherein said ratio is in the range of approximately 2.5:1 to approximately 3:1.	See claim 33 above.
106.	The device of claim 71, wherein said ratio is approximately 4:1.	See claim 33 above.
107.	The device of claim 71, comprising more than one thousand reservoirs.	See claim 9 above.
108.	The device of claim 71, comprising thousands of reservoirs.	See claim 9 above.
109.	The device of claim 71, comprising many thousands of	See claim 9 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	reservoirs.	
110.	The device of claim 71, further comprising cooling means for lowering the temperature of the substrate surface.	See claim 40 above.
111.	The device of claim 88, wherein the nonaqueous fluid comprises an organic solvent.	See claim 20 above.
112.	The device of claim 88, wherein the nonaqueous fluid comprises a non-biological fluid.	See claim 20 above.
113.	A method for ejecting a fluid from a fluid reservoir toward designated sites on a substrate surface, comprising: (a) providing a device comprised of: (i) a reservoir containing a first fluid, said reservoir having an aperture that enables conduction of acoustic energy in a substantially uniform manner, said aperture having a selected cross-sectional width; and (ii) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a focusing means capable of focusing the generated acoustic radiation to emit a droplet from a surface of the first fluid contained within the fluid reservoir, said surface being an effective distance from the aperture, wherein the ratio of the effective distance from the aperture to the cross-sectional width of the aperture is greater than about 2:1;...	See claim 1 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	...(b) positioning the ejector so as to be in acoustically coupled relationship to the fluid-containing reservoir, wherein the position of the ejector places the focusing means the effective distance away from the surface of the first fluid; and...	See claim 2 above.
	...(c) activating the ejector to generate acoustic radiation having a focal spot of a diameter D at the surface of the first fluid, thereby ejecting a droplet of the first fluid from the reservoir.	See claim 1 above.
114.	The method of claim 113, wherein said ratio is greater than approximately 3:1.	See claim 33 above.
115.	The device of claim 113, wherein said ratio is in the range of approximately 2.5:1 to approximately 3:1.	See claim 33 above.
116.	The method of claim 113, wherein said ratio is no more than 4:1.	See claim 33 above.
117.	The method of claim 113, wherein said ratio is approximately 4:1.	See claim 33 above.
118.	The method of claim 113, wherein the ejected droplet has a diameter less than the diameter of the focal spot.	See claim 46 above.
119.	The method of claim 118, wherein two droplets are ejected during step (c).	See claim 46 above.
120.	The method of claim 119, wherein the two ejected droplets are deposited as first and second droplets and the second droplet is larger than the first droplet.	See claim 46 above.
121.	The method of claim 119, wherein each of the ejected droplets has a width less than D.	See claim 46 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
122.	The method of claim 113, wherein the device comprises a plurality of reservoirs each adapted to contain a fluid, and wherein the device is capable of ejecting a fluid droplet from each of the plurality of reservoirs toward a plurality of designated sites on the substrate surface and the method further comprises:…	See claim 3 above.
	…(d) positioning the ejector so as to be in acoustically coupled relationship to a second fluid-containing reservoir containing a second fluid; and …	See claim 2 above.
	…(e) activating the ejector as in step (b) to eject a droplet of the second fluid from the second reservoir toward a second designated site on the substrate surface.	See claim 3 above.
123.	The method of claim 122, wherein each of the ejected droplets of the first fluid and second fluids has a width less than D.	See claim 46 above.
124.	The method of claim 122, wherein two droplets are ejected during at least one of steps (c) or (e).	See claim 46 above.
125.	The method of claim 124, wherein each of the two droplets ejected during step (c) or (e) has a width less than D.	See claim 46 above.
126.	The method of claim 124, wherein at least two ejected droplets are deposited at the same designated site on the substrate surface.	See claim 54 above.
127.	The method of claim 126, wherein the two ejected droplets are deposited as first and second droplets and the second droplet is larger than the first droplet.	See claim 46 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
128.	The method of claim 122, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet size and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet of the desired size.	See claim 56 above.
129.	The method of claim 122, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet velocity and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet at the desired droplet velocity.	See claim 56 above.
130.	The method of claim 122, further comprising repeating steps (d) and (e) with one or more additional fluid-containing reservoirs.	See claims 2 and 3 above.
131.	The method of claim 122, wherein each of the ejected droplets has a volume of 5 pL.	See claim 59 above.
132.	The method of claim 122, wherein each of the ejected droplets has a diameter in the range of about 30 micrometers to about 60 micrometers.	See claim 59 above.
133.	The method of claim 122, wherein each of the ejected droplets has a diameter in the range of about 120 micrometers to about 250 micrometers.	See claim 59 above.
134.	The method of claim 122, wherein each of the ejected droplets has a diameter in the range of about 60 micrometers to about 500 micrometers.	See claim 59 above.

Claim #	Claim Limitation	Supp rt in Applicants' Discl sure
135.	The method of claim 122, wherein each of the ejected droplets has a diameter in the range of about 500 micrometers to about 1,000 micrometers.	See claim 59 above.
136.	The method of claim 122, wherein each of the ejected droplets has a diameter in the range of about 1 micrometer to about 10,000 micrometers.	See claim 59 above.
137.	The method of claim 122, wherein each of the ejected droplets has a diameter of less than about 10,000 micrometers.	See claim 59 above.
138.	The method of claim 122, further comprising, before each ejector activation step, measuring the fluid level in the reservoir in acoustically coupled relationship with the ejector.	See claim 66 above.
139.	The method of claim 138, wherein each measuring step is carried out acoustically.	See claim 66 above.
140.	The method of claim 139, wherein each measuring step is carried out using acoustic radiation from the ejector.	See claim 66 above.
141.	The method of claim 113, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet size and during step (c) the ejector is activated so as to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet of the desired size.	See claim 56 above.
142.	The method of claim 113, wherein prior to step (c) an acoustic radiation tone burst duration is selected that is sufficient to achieve a desired droplet velocity and during step (c) the ejector is activated so as	See claim 56 above.

Claim #	Claim Limitation	Support in Applicants' Disclosure
	to generate a tone burst of acoustic radiation of the selected duration, thereby ejecting a droplet at the desired droplet velocity.	

APPENDIX D

U.S. PATENT PUBLICATION NO. 2002/0094582 A1

SERIAL NO. 09/735,709

REMARKS

Applicants present this request for interference in accordance with 37 C.F.R. § 1.607. Applicants respectfully request that an interference be declared between the application filed concurrently herewith (referred to herein as "the present application") and claims 1-59 of U.S. patent number 6,416,164, serial no. 09/910,690 (referred to herein as "the '164 patent"), filed July 20, 2001, and issued on July 9, 2002, a copy of which is attached in Appendix A.

To facilitate consideration by the Examiner, the information required by 37 C.F.R. §§ 1.607 and 1.608 are set forth below under headings which correspond to the subsections of §§ 1.607(a) and 1.608(a).

I. Compliance with 37 C.F.R. § 1.607(a)(1): Identifying the patent

Applicants request that an interference be declared between U.S. patent no. 6,416,164 and the present application, which is a continuation of application serial no. 09/735,709.

II. Compliance with 37 C.F.R. § 1.607(a)(2): Presenting a proposed count

Applicants present proposed count 1 in Appendix B. Applicants reserve the right to add additional counts and/or modify the proposed count as appropriate.

III. Compliance with 37 C.F.R. § 1.607(a)(3): Identifying at least one claim in the patent corresponding to the proposed count

Applicants identify claim 1 of the '164 patent as corresponding to proposed count 1 (see below for further explanation). Applicants reserve the right to designate additional claims of the '164 patent as corresponding to proposed count 1 and/or new or amended counts, as appropriate.

IV. 37 C.F.R. § 1.607(a)(4): Presenting at least one claim corresponding to the proposed count or identifying at least one claim already pending in the application that corresponds to the proposed count, and, if any claim of the patent or application

identified as corresponding to the proposed count does not correspond exactly to the proposed count, explaining why each such claim corresponds to the proposed count

A. The Present Application

Proposed count 1 corresponds to at least claims 1 and 71 in the present application. Claim 1 in the present application is identical to the Applicants' proposed count 1 and therefore corresponds exactly to the proposed count.

Claim 71 in the present application is not identical to the Applicants' proposed count 1. Table I below provides a side-by-side comparison of claim 71 in the present application and proposed count 1.

Table I

Proposed Count 1	**Claim 71 of the Present Application**
1. A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:	71. A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:
(a) a reservoir adapted to contain a fluid and enabling conduction of acoustic energy in a substantially uniform manner; and	(a) a reservoir adapted to contain a fluid and having an aperture that enables conduction of acoustic energy in a substantially uniform manner, said aperture having a selected cross-sectional width; and
(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a lens capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir,	(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a focusing means capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir said surface being an effective distance from the aperture,
said ejector having an f-value of greater than 2.	wherein the ratio of the effective distance to the cross-sectional width of the aperture is greater than about 2:1.

Proposed count 1 defines the same or substantially the same patentable invention under 35 U.S.C. § 135 as defined by claim 71 of the present application. Accordingly, claim 71 corresponds to proposed count 1.

B. Patent No. 6,416,164

Proposed count 1 corresponds to at least claim 1 in the '164 patent. The following chart provides a side-by-side comparison of the proposed count 1 and claim 1 of the '164 patent.

Table II

Proposed Count 1	**Claim 1 of Patent No. 6,416,164**
1. A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:	1. A device for acoustically ejecting a fluid droplet toward a designated site on a substrate surface, comprising:
(a) a reservoir adapted to contain a fluid and enabling conduction of acoustic energy in a substantially uniform manner; and	(a) a reservoir adapted to contain a fluid and having an aperture that enables conduction of acoustic energy in a substantially uniform manner, said aperture having a selected cross-sectional width; and
(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a lens capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir,	(b) an ejector comprised of an acoustic radiation generator for generating acoustic radiation and a focusing means capable of focusing the generated acoustic radiation to emit a droplet from a surface of a fluid contained within the fluid reservoir said surface being an effective distance from the aperture,
said ejector having an f-value of greater than 2.	wherein the ratio of the effective distance to the cross-sectional width of the aperture is greater than about 2:1.

Proposed count 1 defines the same or substantially the same patentable invention under 35 U.S.C. § 135 as defined by claim 1 of the '164 patent.

The '164 patent clearly indicates that claim 1 of the '164 patent is the same invention as that defined by the proposed count. Notably, the title of the '164 patent is "Acoustic ejection of fluids using large F-number focusing elements". In addition, the Abstract of the '164 patent illustrates the correspondence between the claimed ratio and f-values:

> The present invention provides a method and device for the acoustic ejection of fluid droplets from fluid-containing reservoirs using focusing means having an F-number greater than approximately 2. The droplets are ejected toward designated sites on a substrate surface for deposition thereon. In one embodiment, the device is comprised of: a plurality of reservoirs each adapted to contain a fluid; an ejector comprising a means for generating acoustic radiation and a large F-numbered means for focusing the acoustic radiation at a focal point near the fluid surface in each of the reservoirs; and a means for positioning the ejector in acoustically coupled relationship to each of the reservoirs. The invention is useful in a number of contexts, particularly in the preparation of biomolecular arrays.

Accordingly, claim 1 of the '164 patent corresponds to proposed count 1.

Applicants reserve the right to designate additional claims from the present application as corresponding to proposed count 1 and/or new or amended counts, as appropriate.

V. 37 C.F.R. § 1.607(a)(5): Applying the terms of any application claim, (i) identified as corresponding to the count, and (ii) not previously in the application to the disclosure of the application

In the attached Appendix C, Applicants illustrate representative support in the present application for the limitations of the newly presented claims. It is to be noted, however, that the listing in Appendix C is only exemplary and additional support in Applicants' disclosure has been omitted for the sake of brevity. Applicants expressly reserve the right to refer to additional passages if deemed necessary.

To the extent that certain claim limitations do not appear *in haec verba* in Applicants' specification, Applicants submit that Applicants' specification, and in particular at least the cited

passages listed in the table below, clearly convey to one of ordinary skill in the art that Applicants were in possession of the claimed subject matter.

VI. 37 C.F.R. § 1.607(a)(6): Explaining how the requirements of 35 U.S.C. § 135(b) are met, if the claim presented or identified under paragraph (a)(4) of this section was not present in the application until more than one year after the issue date of the patent

The '164 patent issued on July 9, 2002. The claims in the present application are filed herewith on July 9, 2003. Accordingly, no explanation under 35 U.S.C. § 106(a)(6) is necessary.

VII. Compliance with 37 C.F.R. § 1.608: Interference between an application and a patent; prima facie showing by applicant

The '164 patent was filed on July 20, 2001. The present application is filed herewith as a continuation of application serial no. 09/735,709 (referred to herein as the '709 application), filed December 12, 2000. Applicants submit that claims 1-142 are entitled to priority benefit under 35 U.S.C. § 120 and are therefore entitled to an effective filing date of December 12, 2000. Accordingly, the effective filing date of Applicants' application is more than six months prior to the earliest effective filing date of the '164 patent. Therefore, no showing under 37 C.F.R. § 1.608(b) is required.

In compliance with 37 C.F.R. § 1.608(a), Applicants submit that there is a basis upon which Applicants are entitled to a determination of interfering subject matter relative to the '164 patent.

The '709 application was published as U.S. patent application publication no. 2002/0094582 A1 on July 18, 2002, a copy of which is attached in Appendix D for the examiner's convenience.

CONCLUSION

Applicants note that U.S. patent application serial no. 09/735,709 has been assigned to Group Art Unit 1743, "Chemical Analysis," whereas the '164 patent was assigned to Group Art Unit 2853, "Recorders & Printing." Applicants request that the present application and the '164 patent be assigned to Group Art Unit 1743 for the determination of interfering subject matter.

The '164 patent is assigned to Picoliter Inc. The present application is assigned to EDC Biosystems, Inc. Consequently, the '164 patent and the present application are not owned by a single party.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, Applicant petitions for any required relief including extensions of time and authorizes the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket no. 514542000105.

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Respectfully submitted,

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